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CANTOR COLBURN, LLP - PROTON			ZHENG, LOIS L	
55 GRIFFIN ROAD SOUTH			ART UNIT	
BLOOMFIELD, CT 06002			PAPER NUMBER	
			1742	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/604,670

Applicant(s)

ZAGAJA ET AL.

Examiner

Lois Zheng

Art Unit

1742

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 13 December 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-27 and 30-32 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-27 and 30-32 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>11/19/03</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Status

1. New claims 30-32 are added in view of the amendment filed 13 December 2005. Therefore, claims 1-27 and 30-32 remain under examination.

Claim Objections

2. Claims 19 and 23 are objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form.

Claims 19 and 23 have a broader scope than the independent claims 1 and 20 from which they depend. Claims 1 and 20 require first electrode to be a separate component from the sintered porous support member while claims 19 and 23 only requires that the first electrode to be part of the porous support member.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. Claims 1-7, 10, 13-15, 17-18, 20-22 and 24-27 are rejected under 35 U.S.C. 102(b) as being anticipated by Carlson et al. US 5,372,689(Carlson).

Carlson teaches an water electrolyzer(i.e. electrochemical cell) comprising an anode, a cathode and an ion exchange membrane separating the two electrodes(Fig. 4 numerals 7, 9 and 5, col. 2 line 66-col. 3 line 3). The water electrolyzer further teaches a porous support member having multiple-pore sizes(col. 3 line 49-col.4 line 56).

Regarding instant claims 1-2, the porous support member of Carlson reads on the claimed porous support member having first and second portions with the second portion having greater porosity than that of the first portion. Even though Carlson does not teach that the porous support member is sintered, the electrochemical cell of Carlson meets all the structural limitations of the instant claim. The examiner interpret the term "sintered" as describing how the support member is made, i.e. process limitation. Therefore, the claimed limitation of "sintered" support member does not lend patentability to the instant apparatus claim.

Regarding instant claims 3-6, Carlson further teaches that the porosity of the porous support member ranges from about 40% to about 60%. Therefore, the pores in the support member of Carlson having a porosity of about 40-50% meet the limitation of the claimed first portion porosity as recited in instant claims 3-4. The pores of the support member of Carlson having a porosity of about 50-60% meet the limitation of the claimed second portion porosity as recited in instant claims 5-6.

Regarding instant claim 7, since Carlson teaches that the porous support member having multiple pore sizes, each region with one or more different pore sizes

reads on the claimed first, second and third portions. Therefore, the porous support member of Carlson inherently teaches the claimed third portion having the claimed third portion porosity that is less than or equal to the second portion porosity.

Regarding instant claim 10, Carlson further teaches the claimed channel on the second side of the porous support member as seen in Fig. 4.

Regarding instant claim 13, since Carlson's porous support member has multiple pore sizes, the second portion of Carlson's porous support member inherently have the claimed high porosity and lower porosity regions as claimed.

Regarding instant claim 14, Carlson further teaches that metal screen sets in physical and electrical contact with the porous support member(Fig. 4 numeral 1). The metal screen sets of Carlson read on the pressure pad as claimed.

Regarding instant claims 15 and 17-18, Carlson further teaches that the porous support member can be disposed on both side of the anode or cathode(col. 4 lines 46-50). Therefore, Carlson teaches the additional porous support as claimed. The additional porous support member as taught by Carlson meets the structural limitation of the instant claims 17-18 for the same reason as stated in the rejections of instant claims 1-2 above.

Regarding instant claim 20, Carlson's electrochemical apparatus comprises the claimed first and second electrodes, the claimed ionic membrane, the claimed porous support member and the claimed pressure assembly. In addition, since Carlson teaches the claimed porous support member, Carlson inherently teaches the claimed flow field.

Regarding instant claim 21-22, the instant claims are rejected for the same reason as stated in the rejection of instant claims 1-2 and 17-18 above.

Regarding instant claims 24-25, Carlson further teaches that the electrochemical cell is capable of operating at a pressure gradient of up to about 2000psi and greater (col. 2 lines 66-68), which meets the claimed pressure limitations as recited in instant invention.

Regarding instant claim 26, the instant claim is rejected for the same reason as stated in the rejection of instant claim 10 above.

Regarding instant claim 27, the instant claim is rejected for the same reason as stated in the rejection of instant claim 14 above.

5. Claims 1-5, 8, 15, 17-18 and 31 are rejected under 35 U.S.C. 102(e) as being anticipated by Gorman et al US Patent Application Publication 2002/0086195(Gorman).

Gorman teaches an electrochemical cell comprising first and second electrode separated by an ionic membrane(Fig. 2, numerals 42a, 38a and 40a), and a bilayer electrode support member on both side of the electrodes(fig. 2 numerals 44a and 46a), the bilayer electrode support member comprising a fine pore layer with 50% porosity and a coarse pore layer with 65-75% porosity(page 2 paragraph 13).

Regarding instant claims 1-2 and 8, the finer layer of the bilayer support member as taught by Gorman reads on the claimed first portion of the porous support member. The coarse layer of the bilayer support member as taught by Gorman reads on the claimed second portion of the porous support member. Even though Gorman does not teach that the bilayer porous support member is sintered, the electrochemical cell of

Gorman meets all the structural limitations of the instant claim. The examiner interprets the term "sintered" as describing how the support member is made, i.e. process limitation. Therefore, the claimed limitation of "sintered" support member does not lend patentability to the instant apparatus claim.

Regarding instant claims 3-4, the finer layer of the bilayer support member as taught by Gorman reads on the claimed first portion porosities of less than or equal to about 60% as recited in instant claim 3 and the claimed porosity of about 35% to about 50% as recited in instant claim 4.

Regarding instant claim 5, the coarse layer of the bilayer support member as taught by Gorman reads on the claimed second portion porosity of greater than or equal to about 50%.

Regarding instant claim 15 and 17-18, Gorman teaches the claimed additional porous support member with the second portion(i.e. coarse layer) having greater porosity than the first portion(i.e. fine layer) on the other side of the membrane as claimed.

Regarding new claim 31, the bilayer porous support member as taught by Gorman in view of Shiepe comprises the claimed first and second layers.

6. Claim 20 is rejected under 35 U.S.C. 102(e) as being anticipated by Anderson et al US Patent Application Publication 2003/0230495 A1 (Anderson).

Anderson teaches an electrochemical cell comprising a first electrode, a second electrode and an ionic membrane separating the two electrodes (Fig. 4 numeral 75, 77 and 73). The electrochemical cell further comprises a porous fluid flow field

member(Fig. 4 numerals 84 and 74) and a pressure pad(Fig. 4 numeral 71). Therefore, the apparatus of Anderson meets the structural limitations of the instant invention.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claims 16, 19 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Carlson et al. US 5,372,689(Carlson).

The teachings of Carlson are discussed in paragraph 4 above.

Even though Carlson does not explicitly teach that the support members comprises the first and second electrodes, one of ordinary skill in the art would have found the integration of the support members and the electrodes of Carlson obvious since it is well settled that that the use of a one piece construction instead of the structure disclosed in Carlson would be merely a matter of obvious engineering choice. In re Larsen, 340 F.2d 965, 968, 144 USPQ 347, 349 (CCPA 1965). See MPEP 2144.04.

9. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Carlson in view of Shiepe et al. US 6,365,032 B1(Shiepe).

The teachings of Carlson are discussed in paragraph 4 above.

However, Carlson does not explicitly teach the claimed singer layer porous support member with porosity gradient.

Shiepe teaches an electrochemical cell comprising an anode, a cathode and a membrane in between the anode and the cathode(fig. 3). Shiepe further teaches the use of a pressure pad having a porosity gradient from one side of the pad to the other(col. 4 lines 44-60). Shiepe further teaches that the pressure pad can be used as the primary means of membrane support(col. 4 lines 57-60).

Therefore, it would have been obvious to one incorporated the pressure pad of Shiepe into the apparatus of Carlson as the porous support member in order to improve fluid distribution to the membrane, lower the voltage required for the electrochemical reaction and provide structural integrity to the membrane and electrode assembly as taught by Shiepe(col. 4 lines 44-50).

10. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Carlson in view of Chartier et als. US 2004/0183055 A1(Chartier).

The teachings of Carlson are discussed in paragraph 4 above.

However, Carlson does not explicitly teach the claimed singer layer porous support member with porosity gradient.

Chartier teaches a porous layer material having a control porosity gradient, which can be used in electrodes in an electrochemical cell(paragraphs 0019-0028).

Therefore, it would have been obvious to one of ordinary skill in the art to have incorporated the porous layer material with porosity gradient as taught by Chartier into the apparatus of Carlson as the porous support member in order to promote the diffusion, dissociation and recombination of oxygen and reduce energy cost as taught by Chartier(paragraphs 0021-0022 and 0026-0027).

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11. Claims 11-12 and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Carlson in view of Skoczylas et al. US 6,666,961 B1(Skoczylas).

The teachings of Carlson are discussed in paragraph 4 above. However, Carlson does not explicitly teach the claimed channel patterns as recited in instant claims 11-12.

Skoczylas teaches an electrochemical cell comprising anode and cathode separated by an ionic membrane and flow fields with grooves and other flow features (col. 7 lines 14-17, Fig. 4).

Regarding claims 11-12, one of ordinary skill in the art would have found it obvious to have incorporated the grooves and/or flow features into the porous support member of Carlson in order to form an appropriate flow field for various fluids as taught by Skoczylas(col. 8 lines 21-24). In addition, since Skoczylas teaches that the various types of grooves and flow fields are functionally equivalent, one of ordinary skill in the art would have found the claimed flow channel patterns an obvious design choice absent persuasive evidence that the claimed flow feature is significant. It is well settled that change in configurations is a matter of choice which a person of ordinary skill in the art would have found obvious absent persuasive evidence that the particular claimed configuration is significant. In re Dailey, 357 F.2d 669, 149 USPQ 47 (CCPA 1966). See MPEP 2144.04.

Regarding new claim 30, since the grooves and/or flow features of Carlson in view of Skoczylas is on the porous support member, the examiner interprets that the

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grooves and/or flow features(i.e. channel) is disposed between the first and second portions based on the broadest reasonable interpretation.

12. Claims 6, 9, 16 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gorman.

The teachings of Gorman are discussed in paragraph 5 above.

Regarding claim 6, the 60% - 75% porosity of the coarse layer of the bilayer support member of Gorman overlaps the claimed second portion porosity of about 50% to about 70%. Therefore, a prima facie case of obviousness exists. See MPEP 2144.05. The selection of claimed second portion porosity range from the disclosed coarse layer porosity of Gorman would have been obvious to one skill in the art since Gorman teaches the same utility in its coarse layer porosity range.

Regarding claim 9, even though Gorman does not explicitly teach the claimed single layer porous support member with porosity gradient, the claimed porosity gradient does exist(i.e. between the finer layer and coarse layer) in Gorman's bilayer porous support member. Therefore, one of ordinary skill in the art would have found the integration of the two layers of Gorman's bilayer porous support member obvious since it is well settled that making parts integral is an obvious engineering choice.

Regarding claims 16 and 19, even though Gorman does not explicitly teach that the support members comprises the first and second electrodes, one of ordinary skill in the art would have found the integration of the support members and the electrodes of Gorman obvious since it is well settled that use of a one piece construction instead of the structure disclosed in Gorman would be merely a matter of obvious engineering

choice. In re Larsen, 340 F.2d 965, 968, 144 USPQ 347, 349 (CCPA 1965). See MPEP 2144.04.

13. Claims 10-12 and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gorman in view of Skoczylas.

The teachings of Gorman are discussed in paragraph 5 above. However, Gorman does not explicitly teach the claimed channel patterns as recited in instant claims 10-12.

Skoczylas teaches an electrochemical cell comprising anode and cathode separated by an ionic membrane and flow fields with grooves and other flow features (col. 7 lines 14-17, Fig. 4).

Regarding claims 10-12, one of ordinary skill in the art would have found it obvious to have incorporated the grooves and/or flow features(i.e. channel patterns) into the porous support member of Gorman in order to form an appropriate flow field for various fluids as taught by Skoczylas(col. 8 lines 21-24). In addition, since Skoczylas teaches that the various types of grooves and flow fields are functionally equivalent, one of ordinary skill in the art would have found the claimed flow channel patterns an obvious design choice absent persuasive evidence that the claimed flow feature is significant. It is well settled that change in configurations is a matter of choice which a person of ordinary skill in the art would have found obvious absent persuasive evidence that the particular claimed configuration is significant. In re Dailey, 357 F.2d 669, 149 USPQ 47 (CCPA 1966). See MPEP 2144.04.

Regarding claim 30, since the grooves and/or flow features of Gorman in view of Skoczylas is on the bilayer porous support member, the examiner interprets that the grooves and/or flow features(i.e. channel) is disposed between the first and second layers based on the broadest reasonable interpretation.

14. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Gorman in view of Carlson.

The teachings of Gorman are discussed in paragraph 5 above. However, Gorman does not explicitly teach the claimed second portion with higher and lower porosity regions.

The teachings of Carlson are discussed in paragraph 4 above.

Therefore, it would have been obvious to one of ordinary skill in the art to have incorporated the multiple pore sizes in the porous support member as taught by Carlson into the apparatus of Gorman in order to allow simultaneous dual-directional flow and supporting the ion exchange membrane under high pressure gradient conditions as taught by Carlson(col. 4 lines 1-9). The claimed higher and lower porosity regions are inherently present in the second portion of the porous support member of Gorman in view of Carlson due to its multiple pore sizes.

15. Claims 14, 20-25, 27, and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gorman in view of Shiepe.

The teachings of Gorman are discussed in paragraph 5 above. However, Gorman does not explicitly teach the claimed pressure pad.

The teachings of Shiepe are discussed in paragraph 9 above.

Regarding claims 14, 20 and 27, it would have been obvious to one of ordinary skill in the art to have incorporated the pressure pad of Shiepe into the apparatus of Gorman in order to improve fluid distribution to the membrane, lower the voltage required for the electrochemical reaction and provide structural integrity to the membrane and electrode assembly as taught by Shiepe(col. 4 lines 44-50). In addition, the remaining limitation in claim 20 is rejected for the same reasons as stated in the rejection of instant claim 1 above.

Regarding claims 21-22, the instant claims are rejected for the same reasons as stated in the rejection of instant claims 1-2 above.

Regarding claim 23, the instant claim is rejected for the same reason as stated in the rejection of instant claim 19 above.

Regarding claims 24-25, since Gorman in view of Shiepe teach an electrochemical cell that is structurally substantially the same as that of the instant invention, one of ordinary skill in the art would have found it obvious that the porous member of Gorman in view of Shiepe is inherently capable of supporting the membrane at pressure of greater than or equal to about 100 or 500 psi as claimed.

Regarding new claim 32, the bilayer porous support member as taught by Gorman in view of Shiepe comprises the claimed first and second layers.

16. Claim 26 is rejected under 35 U.S.C. 103(a) as being unpatentable over Gorman in view of Shiepe, and further in view of Skoczylas.

The teachings of Gorman in view of Shiepe are discussed in paragraph 15 above. However, Gorman in view of Shiepe do not explicitly teach the claimed channel.

The teachings of Skoczylas are discussed in paragraph 13 above.

Therefore, one of ordinary skill in the art would have found it obvious to have incorporated the grooves and/or flow features(i.e. channel patterns) into the porous support member of Gorman in view of Shiepe in order to form an appropriate flow field for various fluids as taught by Skoczylas(col. 8 lines 21-24). In addition, since Skoczylas teaches that the various types of grooves and flow fields are functionally equivalent, one of ordinary skill in the art would have found the claimed flow channel patterns an obvious design choice absent persuasive evidence that the claimed flow feature is significant. It is well settled that change in configurations is a matter of choice which a person of ordinary skill in the art would have found obvious absent persuasive evidence that the particular claimed configuration is significant. In re Dailey, 357 F.2d 669, 149 USPQ 47 (CCPA 1966). See MPEP 2144.04.

Response to Arguments

17. Applicant's arguments filed 13 December 2005 have been fully considered, but are only partially persuasive.

In the remarks, applicant argues that none of the references teach a sintered porous support member and the word "sintered" is not a process limitation.

The examiner does not find applicant's argument persuasive since a porous support member can be made by a different process such as a process that does not involve sintering as evidenced by Solomon et al. US 4,339,325(Solomon). Solomon teaches forming a porous electrode backing sheet without sintering(abstract, col. 2 lines 32-34).

In addition, applicant argues that Carlson does not teach the claimed multiple porosity and the claimed third portion porosity.

Carlson teaches that the porous support member have multiple pore sizes. One of ordinary skill in the art would have realizes that pore size affects porosity. Assuming the same pore spacing larger pore results in higher porosity. Therefore, multiple pore sizes in the porous support member of Carlson leads to multiple portions of the porous support member having different porosities. Therefore, Carlson inherently teaches the claimed multiple porosity and the claimed third portion porosity.

Applicant further argues that there is no motivation to combine teachings of Skoczylas into the porous support of Carlson or that such combination has an expectation of success.

Skoczylas teaches using an anode and cathode flow fields in an electrochemical cell(Fig. 2 numerals 203 and numeral 205). Skoczylas also teaches that the flow fields can be formed by bipolar plates with grooves or other flow features formed therein(col. 8 lines 15-17). Therefore, Sckoczylas teaches various grooves and flow features may be used in the flow fields, which implies that the various grooves and flow features are functionally equivalent in the flow fields. Skoczylas further teaches that the electrodes in the electrochemical cell is designed for dual directional fluid flow(col. 7 lines 31-33). Therefore, it is inherent that the flow fields of Skoczylas are also designed for dual directional fluid flow in order for the electrochemical cell to be fully functional. Since Carlson's porous member is intended to enable dual-directional flow, one of ordinary skill in the art would have found it obvious to incorporate the grooves and/or other flow

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features of Skoczylas into the porous member of Carlson with expected success. The motivation to combine the teachings of Carlson and Skoczylas is provided in paragraph 11 above.

18. Applicant's arguments, see page 8 lines 21-23, page 9 lines 13-15, page 10 lines 17-27 filed 13 December 2005, with respect to the rejection(s) of claim(s) 9, 16, 19 and 23 have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in paragraphs 8-10, 12 and 15 above.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lois Zheng whose telephone number is (571) 272-1248. The examiner can normally be reached on 8:30am - 5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Roy King can be reached on (571) 272-1244. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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